

REMARKS

Claims 1, 10 and 20 are amended. Claims 1-20, as amended, remain in the application with Claims 3-18 and 13-18 withdrawn. No new matter is added by the amendments to the claims.

The Rejections:

In the Final Office Action dated March 29, 2006, the Examiner rejected Claims 1, 2, 9-12, 19, and 20 under 35 U.S.C. 102(b) as being anticipated by Van Durrett et al. 5,501,571. The Examiner stated that Van Durrett discloses a method for stacking cases on a pallet per the claimed invention. According to the Examiner, the method comprises the steps of: supplying cases to a buffer 20 in a random order (column 1, lines 30-45); defining rules for selecting cases from the buffer 20 to be placed on respective pallet (full layer rule, height/weight rules for stability, and/or exception case rule); determining physical characteristics of cases in the buffer including dimensions of a case base and case height; determining available locations on the pallet where a case in the buffer can be placed (Figures 7-24); using physical characteristics of cases in the buffer and applying the rules to at least a portion of the buffer cases; identifying a selected buffer case that satisfies at least one of the rules and a corresponding position on the pallet for the selected case; and using an industrial robot 90 to place the selected case on the pallet at the corresponding position (Figures 7-24).

In regards to Claim 2, the Examiner stated that the Van Durrett method further comprises reapplying the previously determined rule (i.e. weight rule control loop) before applying another rule to a buffer case.

In regards to Claim 9, the Examiner stated that the Van Durrett method step of determining available positions on the pallet further comprises continually updating available regions on the pallet where a buffer case can be placed as cases are placed on the pallet; and continually replenishing the buffer 20 with cases after a buffer case is placed on the pallet (Figure 1A).

In regards to Claim 10, the Examiner stated that the Van Durrett method further comprises applying the rules sequentially in a variable prioritized order (i.e. heavy cases first) to at least a portion of the buffer cases and the available locations.

In regards to Claim 11, the Examiner stated that the Van Durrett method further comprises repeatedly applying the rules in a variable prioritized order to the buffer cases; repeatedly selecting for placement on the pallet a case that satisfies a rule; and repeatedly placing each case on the pallet in the corresponding location until the platform is filled with cases; supplying an unfilled pallet 99; and continually replenishing the buffer 20 with cases after a buffer case is placed on the pallet (Figure 1A).

In regards to Claim 12, the Examiner stated that the Van Durrett method further comprises reapplying the previously determined rule (i.e. weight rule control loop) before applying another rule to a buffer case.

In regards to Claim 19, the Examiner stated that the Van Durrett method step of determining available positions on the pallet further comprises continually updating available regions on the pallet where a buffer case can be placed as cases are placed on the pallet.

In regards to Claim 20, the Examiner stated that the Van Durrett method further comprises determining physical characteristics of at least one case in the pallet including known case height (height dimension of the case as it is being loaded on the pallet and the maximum allowable height for each layer of cases on the pallet); identifying a pallet cases having a case height equal to a case height of a selected buffer case and a corresponding position adjacent the one pallet case for the selected case; and using an industrial robot to place the selected case on the pallet (Figures 15, 21).

The Response:

Applicants amended Claims 1, 10 and 20 to clarify terminology.

Van Durrett delivers boxes to a conveyor 20 in a random order. The boxes pass through a weighing, dimensioning and scanning module (WDS) 30 that weighs each box, determines its dimensions, and scans its bar code for contents. The WDS information is sent to a processor 70 to determine the pallet configuration and to instruct a queuing module 50 to pull certain boxes and then return them to the conveyor 20 so that the boxes are queued in a proper pallet loading sequence. A robot arm 90 then picks the next box on the conveyor 20 at a pick-up point 80. Thus, the determination as to where to place each box on the pallet is made between the WDS 30 and the queuing module 50.

Fig. 6 of Van Durrett shows the method of building a new pallet wherein the heavy boxes have been queued first 108 and are used to build layers 110 until the maximum height/weight is reached 184 or half of the maximum height has been reached 186 whereupon light boxes are used to complete the pallet 188 by building light layers 192. Thus, the method shown in Figs. 5-24 is a predetermined order of decision points that function with a plurality of boxes that have been organized prior to presentation for placement on the pallet. The method selects the type of box needed next and requests that box from the queue.

The claimed invention pertains to a computer-controlled method for selecting cases presented on a buffer conveyor in random order and using an industrial robot to produce a stable stack of the cases on the pallet. Claims 1 and 10 define a method for stacking cases on a pallet including the steps of:

- a. supplying cases to a buffer in a random order;
- b. defining rules for selecting a buffer case;
- c. determining physical characteristics of the buffer cases including dimensions of a case base and a case height;
- d. determining available positions on the pallet;
- e. using the physical characteristics of the buffer cases and applying the rules;
- f. identifying a selected buffer case that satisfies at least one of the rules and a corresponding position on the pallet; and
- g. using an industrial robot to place the selected buffer case at the corresponding position.

Thus, the claimed method determines case placement based upon the cases currently in the buffer. Claim 20 further defines the method wherein a case already on the pallet is identified as having a case height equal to a case height of a selected buffer case, a corresponding position adjacent the one pallet case is identified and the selected case is placed at the corresponding position.

Van Durrett relies on re-ordering of the cases on the conveyor to accomplish the goal of building a pallet. All of Applicants' claims build the pallet with cases supplied in a random order.

Van Durrett describes an Expert system that builds layers and walls to accomplish the intended purpose. The expert system uses Partition plans which are described as a method of

breaking the pallet into two sections and mapping boxes onto each section. This is really a series of known pattern for the boxes.

Applicants do NOT reorder the cases on the conveyor. Figure 1 shows a common pickup point with the boxes presented in series, while the robot arm 14 can pickup from various spots on the conveyor. The implementation of Applicants' method does not have the complexity of reordering boxes on the conveyor as does Van Durrett.

Applicants' method does build layers, but that has been a standard approach that was used with same size boxes for years (referenced as prior art via Patent 4,786,229). Applicants do not take the approach of building walls as described in by Van Durrett, but rather use a variety of factors to decide where to place the box, without any emphasis on building walls/columns.

Applicants use a notation of predefined patterns for full layers, but these are adjusted due to the size of the pallet and boxes for every decision.

In the prior art, the "expert system" applied a fixed procedure (e.g. layers, then walls/columns in the Van Durrett patent) with a given set of criteria to build the pallet. Instead, Applicants apply a set of rules that is adjusting to the mix of boxes in front of the robot. In summary, Van Durrett uses dedicated logic and decision blocks on a flowchart versus Applicants' concept of generalized rules.

Van Durrett does not use various rules to decide where to place a case from a random buffer onto a pallet. The method to choose locations for a box is to use various "partition plans" and decide which partition plan was best based on levelness and cube efficiency. As stated on Page 2, Lines 39-42, a partition plan is a method to break the pallet into two sections and mapping cases from the buffer into either of the two sections. This is known as pattern matching to find the best partition plan or pattern for the current cases. There is no set of rules to decide how to place a case, just a pre-defined set of partition plans/patterns.

The decision blocks on the Van Durrett flowchart do not correspond to a configurable set of rules (AdhHeight, FullLayer, BestCase, etc.) in the decision process as to where to place a case. A rule (as used by Applicants) is more than just one decision as to where to place a case. Each rule has a given set of criteria that must be met for a particular rule to be invoked. If not met, then the next rule is evaluated. Each of Applicants' rules typically has as many decision blocks as shown on all of the Van Durrett flowcharts.

Van Durrett defines a set of decisions that is fixed and not configurable. It does map a series of steps/decisions that are made to define where to place a case. This is the "expert system". This is a series of decisions that are made to place a case depending on current conditions. Van Durrett just uses two decision (layers or walls) on two types of parts (heavy or light).

In reference to Claim 2, the Examiner stated that Van Durrett reapplies the previously determined rule (weight control loop) before applying another rule to a buffer case. The Examiner has confused the control loop evaluating the CURRENT conditions of the pallet and buffer with the idea of remembering which decision was made last time. In the control loop, decisions are made based on the current decision, not what was done last time. There is some memory as to what type of layer (heavy or light) is being built and which partition plan is being used, but these are common practices of the palletizing industry. Remembering the current state of the pallet is different than remembering what rule and was used last and whether to skip various decision to invoke that rule again.

In reference to Claim 9, Van Durrett does not maintain a list of available regions or positions for a case to be placed. It keeps a list of previously placed cases and creates a partition plan which is two vertical sections based on previous layers (not individual cases). It only keeps lists of potential layer locations, not individual case locations.

In reference to Claim 10, Van Durrett does not use a variable prioritized order to apply the decisions. The decisions are fixed and not changeable.

In reference to Claim 11, Van Durrett does not apply rules in a variable prioritized order. Van Durrett does fill pallets by placing a case and continuing the operation until the pallet is full; but the method of applying the "rules" is different. The Van Durrett order is fixed and Applicants' order is variable and prioritized.

In reference to Claim 12, Van Durrett does not reapply a previous decision, but continually makes decisions based on current conditions only.

In reference to our Claim 19, Van Durrett does not maintain a list of available positions. See earlier comment regarding Claim 9.

In reference to Claim 20, Van Durrett does check the buffer for cases that match the height criteria of the current partition. However, the method only checks the partition height against available cases. It does not check cases in the buffer against previously placed cases, but

rather against the partition plan. Since Van Durrett is dealing with layers and walls, the list of potential positions next to previously placed cases that match the height of cases in the buffer is limited to cases in the current partition plan and not all of the previously placed cases. Applicants' method checks cases in the buffer against all previously placed cases and not just cases that were placed by the current decision or method.

The Van Durrett method is a fixed methodology that fails to respond to changes in the current decision. For example, the method fails when a case to finish a partition is dropped or is missing. This creates a hole at the corner which eventually causes stability and efficiency problems. By using a set of rules, Applicants can handle such special conditions and considerations as part of the normal process.

Van Durrett describes a method whereby a set of decisions must be processed in a fixed order to place a box on a pallet. Applicants' claims define a method using a set of rules to place a box on a pallet when one of the rules is satisfied.

In view of the amendments to the claims and the above arguments, Applicants believe that the claims of record now define patentable subject matter over the art of record. Accordingly, an early Notice of Allowance is respectfully requested.